

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-030222

(43)Date of publication of application : 02.02.1996

(51)Int.Cl. G09G 3/00
G09G 5/00
G09G 5/00
H04B 7/24
H04L 29/08

(21)Application number : 06-181942

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(22)Date of filing : 12.07.1994

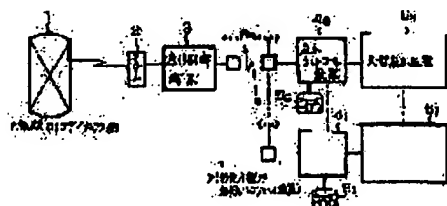
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(54) DISPLAY SYSTEM USING RADIO REPEAT

(57)Abstract:

PURPOSE: To relax a limitation on the setting up of a device and to reduce noise interference through the ground by performing transmission between a communication control terminal and a display controller, a display device with a radio transmission system.

CONSTITUTION: Image information formed by the communication control terminal 3 is formed into a file of a bit map, and the control terminal 3 instructs the display controllers 4a, for display and transfer of files and controls them by ID numbers through respective radio interfaces. A radio interface device 7 uses a specified small power source, and error correction and retransmission are performed between radio units. The display controller 4a stores receiving the display instruction data and the image bit map file in an HDD 5i at a format matching with the size of the display device 6a. The display controller 4a reproduces the bit map file by the instructed display instruction data to convert it into a video signal. The large-sized display device 6a reproduces the video signal and display it.



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LEGAL STATUS

[Date of request for examination] 20.04.2001

[Date of sending the examiner's decision of rejection] 12.08.2003

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

(54) [Title of the Invention] Information display device employing wireless relay

(57) [Abstract]

[Purpose] To provide a display method employing wireless relay, which greatly relaxes the constraints on device placement, and enables considerable lengthening of the distance between the communication control terminal and the display control device and display device, and moreover enables alleviation of noise interference through the earth.

[Configuration] A configuration is employed in which transmission between the communication control terminal and the display control device and display device is performed by means of a wireless transmission system.

[Claim 1] An information display device employing wireless relay, comprising:

- a communication control terminal, which converts display information input via a modem connected to a public network into prescribed interface signals, and outputs the signals;

- a display control device, which converts prescribed interface signals output from the communication control terminal into video signals, reads display pattern information corresponding to the video signals from

memory in which the information has been stored in advance, and outputs the information; and

a display device, which displays display pattern information output from the display control device,

display pattern information corresponding to said display information transmitted from a subscriber to said public network being displayed on said display device,

the information display device being characterized in that a wireless interface device, which performs transmission and reception of said prescribed interface signals by a wireless circuit with specific low power, is provided between said communication control terminal and said display control device.

[Claim 2] The information display device employing wireless relay according to Claim 1, characterized in that in said wireless interface device, at least one wireless relay is placed in said wireless circuit with specific low power, and that display of said display device in a remote location is controlled from said communication control terminal.

[Claim 3] An information display device employing wireless relay, which is a multi-drop format information display device, comprising:

a communication control terminal, which converts display information input via a modem connected to a public network into prescribed interface signals, and outputs the signals;

a plurality of display-side devices, which display display pattern information corresponding to said display information by means of prescribed interface signals output from the communication control terminal; and

a wireless interface device which connects said communication control terminal and said plurality of display-side devices by a wireless circuit, via at least one wireless relay with specific low power;

the information display device being characterized in that in said wireless interface device, unique ID numbers are assigned in advance to display-side wireless units connected to said plurality of display-side devices, respectively, and only when the ID number contained in display information sent from a terminal-side wireless unit coincides with the ID number of the wireless unit, the received data is transferred to said display-side device.

[0001]

[Industrial Field of the Invention] This invention relates to a display method to provide various information by means of a display element of appropriate size, installed on the streets of a shopping and amusement area suitable for advertisements or on rooftops or various facilities where guidance is necessary, and in particular relates to an information display device using wireless relay.

[Detailed Description of the Invention]

[0002]

[Prior Art] Specific examples of this type of display method are shown in Fig. 5 and Fig. 6. Fig. 5 is called RS232C, which employs a point-to-point mode; 1 is a public network or videotex network comprising an information source which sends information for display; 2 is a modem which demodulates transmitted signals into baseband signals and which modulates necessary signals of the information source for sending; 3 is a communication control terminal (possibly comprising local input device functions) to exchange baseband signals with the modem 2 and to output RS232C-level signals to the display device; 4 is a display control device to convert RS232C-level signals into video signals, as character signals necessary for display; 5 is high-density data memory to store pattern information for the video signals; and 6 is a large-size display device which displays the video signals from the display control device 4 as pattern information. Fig. 6 is an example in the prior art of a display method conforming to the RS485 interface, adopting a multi-drop connection mode; the configuration is similar to that in Fig. 5, except for comprising a plurality of series of display control devices 4a to 4i, high-density data memories 5a to 5i, and large-size display devices 6a to 6i. In the display method of the prior art according to Fig. 5 and Fig. 6, the communication control terminal 3 and the control devices

4 and 4a to 4i are connected by a wire transmission path; as indicated in Fig. 7, signals are transmitted in both directions.

[0003]

[Problems to be Solved by the Invention] Using a wire path such as described above, there are constraints on attenuation of transmission signals in addition to constraints on wiring placement, and there has been the constraint with respect to placement conditions that the communication control terminal 3 must be placed in proximity to the display control 4 and large-size display device 6. Also, in the example of Fig. 6, differential-type signals are often used, but there are the disadvantages of constraints on wiring routes and susceptibility to differential noise.

[0004] An object of this invention is to provide an information display device using wireless relay, which greatly relaxes constraints on device placement, which also enables considerable lengthening of the distance between the communication control terminal, and the display-side device comprising a display control device and display device, and moreover can alleviate noise interference through the earth.

[0005]

[Means to Solve the Problem] In order to attain this object, the essence of an information display device employing wireless relay of this invention is the use, in

place of a conventional wire transmission path, of a specific low-power wireless transmission path for transmission between a communication control terminal, and a display-side device comprising a display control device and display device. The specific configuration is an information display device comprising a communication control terminal, which converts display information input via a modem connected to a public network into prescribed interface signals and outputs the signals; a display control device, which converts prescribed interface signals output from the communication control terminal into video signals, and reads display pattern information corresponding to the video signals from memory in which the information has been stored in advance, and outputs the information; and a display device, which displays display pattern information output from the display control device; display pattern information corresponding to the display information transmitted from a subscriber to the public network being displayed on the display device, and the information display device being characterized in that a wireless interface device, which performs transmission and reception of the prescribed interface signals by a wireless circuit with specific low power, is provided between the communication control terminal and the display control device. Further, [the information display device] is characterized in that in the wireless

interface device, at least one wireless relay is placed in the wireless circuit with specific low power, and that display of the display device in a remote location is controlled from the communication control terminal.

[0006]

[Embodiments] Fig. 1 shows an embodiment of a multi-drop format of a display method of this invention; each of the portions of the public network or videotex network 1, modem 2, communication control terminal with local input functions 3, display control devices 4a to 4i, high-density data memory (HDD) 5a to 5i, and large-size display devices 6a to 6i are themselves similar to those of the prior art shown in Fig. 6. However, in this invention, wireless transmission paths are formed by a specific low-power wireless interface device 7 between the communication control terminal with local input functions 3 and the display control devices 4a to 4i.

[0007] Next, operation of this embodiment is explained.

(1) As the information source, reception via circuits or input locally is selected, and image information created by the communication control terminal 3 is created in a bitmap file. The communication control terminal 3 issues display instructions to the display control device 4, performs file transfer, and uses ID numbers for management via each of the wireless interfaces.

(2) The wireless interface device 7 uses specific low-power radio waves, and performs error correction and

resending between wireless units. ID numbers are registered in advance in display portion-side wireless units, and when a unit's own ID is detected a response is returned to form a network. When an ID is other than its own, a display portion-side wireless unit stops sending radio waves, and does not respond so long as there is no query from the communication control terminal 3 (or from a local input device).

(3) The display control device 4 stores the received display instruction data and image bitmap file on a HDD 5, in a format according to the size (dot matrix) of the display device 6.

(4) The display control device 4 reproduces in advance the bitmap file based on display instruction data for which there has been an instruction, and converts the result to video signals.

(5) The large-size display device 6 reproduces and displays the video signals.

[0008] Fig. 2 shows one example of these interface operations. They correspond to the operations of Fig. 7 in conventional devices, but a transmission operation by the wireless interface device 7 is added.

[0009] In Fig. 3, a plurality of wireless relays 8a to 8i are placed in each of the wireless transmission intervals formed between the terminal-side wireless modem 7-1 and the display portion-side wireless modems 7-2 of

the wireless interface device 7; in principle, by increasing the number of relays 8a to 8i, the distance of the wireless transmission paths can be extended as much as necessary. Fig. 4 shows the flow of signal transmission operations, showing interface operations in this case.

(1) The terminal-side wireless modem 7-1 transmits to relays to which the ID number of the display portion is assigned ({1} to {3} in Fig. 3). Upon identifying its own ID, the display portion 7-2 returns an ACK to the relays ({4} to {6} in Fig. 3). {}-1 indicate ACKs during reception.

(2) Each of the relays 8a to 8i monitors a timer to wait for an ACK to the ID it has sent. If an ACK is not returned within the monitored timer time, the relay 8a to 8i resends.

(3) The terminal-side wireless modem 7-1 receives an ACK twice and recognizes one text message completion.

[0010] Fig. 1 is an embodiment of the invention for the multi-drop format explained referring to Fig. 6, but this invention can also be applied to the point-to-point format explained referring to Fig. 5.

[0011]

[Advantageous Results of the Invention] As explained in detail above, by means of this invention, the following advantageous results are obtained.

- (1) It is possible to replace conventional interfaces (RS232C and RS485) with a wireless [interface] without further modification; physical constraints for each interface are eliminated, and display devices may be placed in any location.
- (2) Limitations on the number of multi-drops, which had been a problem with wire connections, are eliminated, and control of a plurality of devices is possible.
- (3) At the RS484 level, through a wireless relay over a distance of 1 km, theoretical limitations are eliminated. Hence, display control is possible from any remote location.

[Brief Description of the Drawings]

Fig. 1: A block diagram showing an embodiment of the invention.

Fig. 2: An operation flow diagram showing an example of signal transmission in the embodiment of Fig. 1.

Fig. 3: A block diagram showing a configuration example in which relays are provided in the wireless transmission interval in the embodiment of Fig. 1.

Fig. 4: An operation flow diagram showing an example of signal transmission for the case shown in Fig. 3.

Fig. 5: A block diagram showing a display method example for a conventional point-to-point format.

Fig. 6: A block diagram showing a display method example for a conventional multi-drop format.

Fig. 7: An operation flow diagram showing an example of signal transmission of the prior art shown in Fig. 5 or Fig. 6.

[Explanation of Symbols]

- 1 Public network or videotex network
- 2 Modem
- 3 Communication control terminal (or local input device)
- 4, 4a to 4i Display control device
- 5, 5a to 5i High-density data memory (HDD)
- 6, 6a to 6i Large-type display device
- 7 Specific low-power wireless interface device
 - 7-1 Terminal-side wireless modem
 - 7-2 Display portion-side wireless modem
- 8a to 8i Relay